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Histopathological Spectrum of Lung Lesions in Unclaimed Dead Bodies: An Autopsy-Based Study

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Abstract-

Background:

Unclaimed and homeless individuals are highly vulnerable to infectious and chronic diseases, with respiratory disorders being a major contributor to morbidity and mortality. Postmortem histopathological examination of lungs provides valuable insights into the prevalence of pulmonary disease in this neglected population.

Methods:

This prospective observational study was conducted on 96 unclaimed/unidentified bodies brought for medicolegal autopsy at King George's Medical University, Lucknow. Gross and histopathological samples were collected from all lobes of both lungs. Findings were analysed according to age, sex, and lobar distribution.

Results:

Grossly, congestion was the most common finding (27.7%), followed by anthracosis with dilated alveolar spaces (17.2%) and consolidation (8.5%). Caseous necrosis was mainly observed in the right lung. Microscopically, emphysema (17.1%) and pneumonia (15.8%) were the leading lesions, followed by pulmonary oedema (10.2%), hemosiderotic changes (5.6%),

and tuberculosis granulomas (5.4%). Emphysema was more common in males, while pneumonia predominated in females. Lower lobes showed higher involvement across most pathologies.

Conclusion:
Emphysema, pneumonia, and pulmonary congestion were the predominant lung lesions in unclaimed individuals. The findings highlight the combined impact of smoking, environmental exposures, infections, and neglected healthcare access in this population. Public health measures focusing on tuberculosis control, smoking cessation, and improved shelter conditions are crucial to reduce respiratory disease–related mortality among the homeless.

Keywords: ***Autopsy, Histopathology, Lungs, Unclaimed bodies, Homeless, Pulmonary lesions***

Introduction:

Homelessness continues to be a major social and public health concern in India, influenced by overlapping social, economic, and environmental factors [1-3]. According to the *Census of India 2001*, nearly two million people were classified as houseless, defined as individuals living without a roofed dwelling, often surviving on pavements, roadside shelters, under staircases, or in religious and public spaces [1]. Such vulnerable populations are at heightened risk of morbidity and mortality due to both communicable and non-communicable diseases [2,4,5]. Unclaimed bodies, as described under the *Delhi Anatomy Act, 1953*, include those of persons who die in public places, hospitals, or prisons and remain unclaimed by relatives or acquaintances within the prescribed time [4]. These individuals often lack access to healthcare during life, and the causes of their death frequently remain undiagnosed [6]. The lungs are among the most commonly affected organs in natural deaths. They are highly susceptible to a wide range of inflammatory, infectious, neoplastic, and degenerative conditions and are frequently involved in terminal events secondary to cardiovascular disease [7,8]. Autopsy studies, particularly those incorporating histopathology, provide valuable insights into the prevalence and distribution of lung pathology in populations otherwise excluded from routine healthcare surveillance [8,9]. By studying pulmonary pathology in unclaimed or unidentified individuals, data can be generated to guide preventive public health strategies, especially in relation to tuberculosis, pneumonia, chronic obstructive pulmonary disease, and environmentally linked conditions such as anthracosis. This study was undertaken to document the gross and microscopic spectrum of lung pathology in unclaimed and unknown bodies subjected to medicolegal autopsy in a tertiary-care centre.

Aims & Objectives

Aim:
To evaluate the gross and histopathological spectrum of lung diseases in unclaimed or unidentified bodies brought for medicolegal autopsy.

Objectives:
1. To identify the different pulmonary diseases in unclaimed/unknown corpses.
2. To assess the distribution of lung diseases in different lobes of both lungs.

Materials and Methods

Study Setting and Design

This observational prospective study was carried out from January 2021 to January 2022 in the Department of Forensic Medicine and Toxicology at King George's Medical University, Lucknow.

Study Population

- **Inclusion criteria:** Unclaimed, unidentified, and destitute bodies brought for medicolegal autopsy.
- **Exclusion criteria:** Known or identified cases, decomposed/putrefied bodies, newborns and infants, and cases with traumatic lung injury.

Sample Size

The minimum required sample size was estimated using the formula for observational studies:

Estimation of Sample Size (n) for observational studies,

$$(n) = \frac{(Z1\text{-}\alpha/2)^2 \times P\ (1\text{-}\ P)}{D^2}$$

n = Desired sample size
Zl−α/2 = Critical value and a standard value for the corresponding level of confidence.
[At 95% CI or 5% level of significance (type-I error, p<0.005) it is 1.96]
P = Expected prevalence or based on previous research
D = Margin of error or precision

In our study we use, Z1-α/2 = 1.96 (for 95% Confidence Intervals)
80 % power of study
P = 50 % (0.50) for infinite population
D = 10% Margin of error

$$\text{Sample Size} = \frac{(1.96)^2 \times 0.50 \times (1\text{-}\ 0.50)}{(0.10)^2} = \mathbf{96}$$

The calculated sample size was **96**. Hence, **96** unclaimed cases were included in this study.

Procedure

Unclaimed bodies were preserved in a mortuary freezer for 72 hours before autopsy. During autopsy, representative lung tissue samples (4–5 cm) were collected from each lobe — right upper, right middle, right lower, left upper, and left lower lobes. Gross abnormalities were noted at autopsy, and samples were fixed in 10% formalin, processed, and stained with haematoxylin and eosin for microscopic examination.

Data Analysis

Gross and histopathological findings were documented and analysed according to age, sex, and lobe involvement. Results were summarized as frequencies and percentages, and comparative analysis was done across different demographic subgroups

Results

A total of 96 unclaimed/unidentified bodies were examined. Of these, 89 were male (92.7%) and 7 were female (7.3%). The age distribution showed that 21 cases (21.9%) were in the 20–35 years group, 40 cases (41.7%) in the 36–50 years group, 32 cases (33.3%) in the 51–65 years group, and 3 cases (3.1%) were above 65 years.

Gross Findings

Congestion was the most frequent gross abnormality across all lobes, observed in 27.7% of samples, followed by anthracosis with dilated alveolar spaces (17.2%), consolidation (8.5%), and caseous necrosis (7.1%).

Table 1. Gross findings in different lobes of the lungs (n = 96)

Finding	RUL	RML	RLL	LUL	LLL	Total (%)
Congestion	18	26	31	27	31	133 (27.7)
Anthracosis + dilated alveolar spaces	13	16	18	17	19	83 (17.2)
Consolidation	8	7	9	10	7	41 (8.5)
Caseous necrosis	9	10	9	3	3	34 (7.1)
Red hepatization	4	3	1	1	2	11 (2.3)
Cystic changes	3	2	4	2	4	15 (3.1)
Infarct	1	2	2	1	0	6 (1.2)
Calcification	2	0	1	2	0	5 (1.0)

RUL: Right Upper Lobe; RML: Right Middle Lobe; RLL: Right Lower Lobe; LUL: Left Upper Lobe; LLL: Left Lower Lobe

Congestion was most frequently noted in the right and left lower lobes, while anthracosis predominated in the left lower lobe. Caseous necrosis was mainly observed in the right lung lobes.

Microscopic Findings

Histological examination revealed emphysema (17.1%) as the most common lesion, followed by pneumonia (15.8%), pulmonary oedema (10.2%), hemosiderotic changes (5.6%), and tuberculosis granulomas (5.4%). Less frequent findings included fibrosis (2.7%), chronic inflammatory infiltrates (4.8%), necrosis (1.0%), and thrombus (1.2%).

Table 2. Microscopic findings in different lobes of the lungs (n = 96)

Finding	RUL	RML	RLL	LUL	LLL	Total (%)
Emphysema	14	17	17	14	20	82 (17.1)
Pneumonia	13	15	16	16	16	76 (15.8)
Pulmonary oedema	8	7	12	8	14	49 (10.2)
Hemosiderotic changes	3	6	7	7	4	27 (5.6)
Tubercular granuloma	5	8	8	2	3	26 (5.4)
Chronic inflammatory infiltrate	4	4	0	7	8	23 (4.8)
Fibrosis	0	3	4	2	4	13 (2.7)
Necrosis	2	1	1	1	0	5 (1.0)
Thrombus	1	2	2	1	0	6 (1.2)
Tumor	1	0	1	2	0	4 (0.8)

RUL: Right Upper Lobe; RML: Right Middle Lobe; RLL: Right Lower Lobe; LUL: Left Upper Lobe; LLL: Left Lower Lobe

Emphysema was most commonly identified in the left lower lobe, while pneumonia was almost equally distributed across all lobes. Pulmonary oedema was most prevalent in the left lower lobe, whereas tuberculosis granulomas were mainly observed in the right middle and lower lobes.

Discussion

The present study examined the gross and histopathological spectrum of pulmonary lesions in unclaimed and unidentified dead bodies. The findings revealed that congestion, anthracosis, emphysema, and pneumonia were the predominant lesions, highlighting the high prevalence of respiratory pathology in socioeconomically deprived populations lacking access to healthcare. Congestion was the most frequent gross finding (27.7%), consistent with studies by Nayak et al. and Sharma et al., who also reported pulmonary congestion as a common autopsy finding due to terminal hypoxia or cardiac failure in natural deaths [10,11]. Anthracosis observed in 17.2% of lungs signifies chronic exposure to polluted environments and smoke inhalation. Similar findings were documented by Kumar et al., who emphasized the link between urban pollution, occupational dust exposure, and anthracotic pigmentation in the lungs of homeless and industrial workers [12]. Microscopically, emphysema (17.1%) was the most prevalent lesion in the present series. This correlates with the reports of Reddy et al. and Garg et al., who observed emphysematous changes as a frequent finding among chronic smokers and elderly individuals subjected to autopsy [13,14]. The higher male predominance in emphysema cases in the current study may be attributed to the greater prevalence of tobacco smoking and occupational dust exposure among men [15]. Pneumonia was noted in 15.8% of cases, aligning with studies by Chandrashekar et al. and Kumari et al., who observed pneumonia as a leading cause of natural death in unclaimed bodies, particularly among individuals with poor nutrition

and compromised immunity [16,17]. The equal distribution of pneumonia across lung lobes in this study supports the notion that aspiration and infection often involve multiple lobes, particularly in debilitated or intoxicated persons [18]. Pulmonary oedema was seen in 10.2% of lungs, a finding comparable with that of Gupta et al. and Patel et al., who suggested that acute cardiac failure and terminal hypoxia were major contributors [19,20]. Tubercular granulomas were found in 5.4% of cases, underscoring the persistent burden of tuberculosis among the urban homeless population. Studies by Narayan et al. and Bharathi et al. reported tuberculosis in 4–10% of unclaimed autopsy cases, attributing it to poor living conditions, overcrowding, and lack of medical care [21,22]. The predominance of lower lobe involvement in this study is in accordance with earlier observations by Mitra et al. and Das et al., who found that gravitational effects, vascular distribution, and infection dynamics often predispose the lower lobes to pathological changes [23,24]. Furthermore, the male-to-female ratio (12.7:1) in this study reflects the demographic pattern of unclaimed bodies seen in most urban mortuaries, as reported by Kaur et al. [25].

Conclusion

This study highlights the interplay of environmental pollution, smoking, infection, and social neglect as major determinants of pulmonary pathology in the homeless and unclaimed population. Regular surveillance of respiratory disease burden through autopsy-based studies can assist in shaping targeted public health measures, including tuberculosis control, smoking cessation, and air quality improvement programs. Improved access to primary healthcare and shelters may significantly reduce preventable respiratory deaths in this marginalized section of society.

Ethical approval

Institutional Ethics Committee of King George's Medical University, Chowk, Lucknow, Uttar Pradesh, India, approved this project with Ref. code.102nd ECM II B-Thesis/P127.

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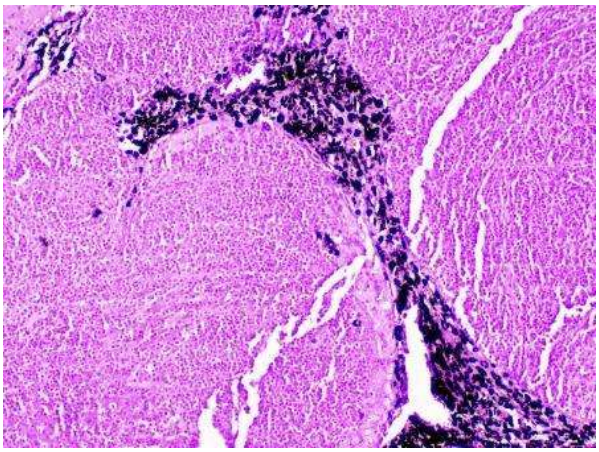
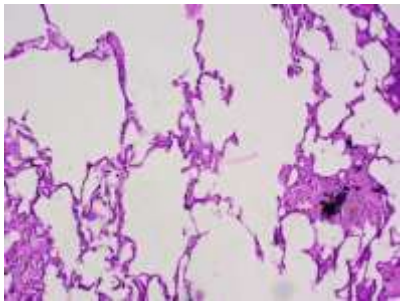
Left lung show caseous necrosis – Tuberculosis

Right and Left lung showing hyperpigmentation (Anthracosis)

Congested lung - Pneumonia



Extensive inflammatory infiltrate with carbon particles, pneumonia



Dilated alveolar spaces characteristics of Emphysema

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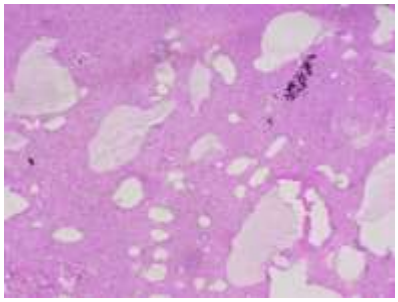
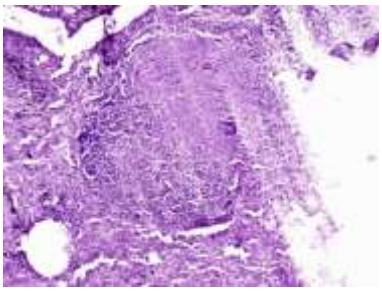
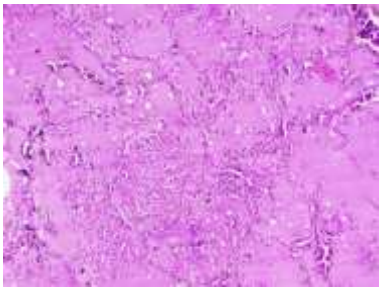


Caseous necrosis, Tuberculosis



Epithelioid cell granuloma, Caseous necrosis, Giant cell, Tuberculosis



Alveolar spaces filled with pinkish material, alveolar walls showing congested vessels characteristics of pulmonary oedema